

Autonomous Multi-Robot Exploration using UWB, Phase I

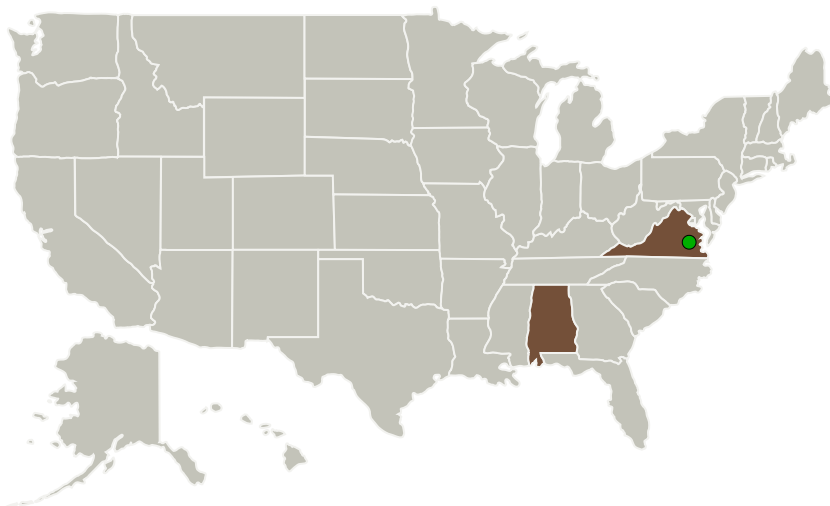
Completed Technology Project (2012 - 2013)



Project Introduction

Single multi-sensor teleoperated systems are not optimal for NASA exploratory missions because they limit the coverage area and scope of exploration and create a single point for mission failure. A better solution would use many robots cooperating to maximize exploration area and location accuracy while minimizing total system power and weight. The goal of this research is to investigate pulsed-RF Ultra Wideband (UWB) technology for its ability to simultaneously provide enhanced ad hoc wireless communication, distributed precision navigation/localization, and radar sensing. The ultimate goal is development of a subsumed navigation layer providing a straightforward mechanism for distributed autonomous guidance algorithms to quickly detect, share, and adapt to changes in the environment using novel distributed navigation controls. Pulsed-RF UWB supports simultaneous communications, peer-to-peer precision ranging, and multi-static radar. Using this single basis technology will enable more and smaller exploratory agents. Using UWB would solve communication and localization issues, while providing the added benefit of radar sensing and imaging. Larger spatial areas would be more accurately explored with lower power/weight/volume and with much greater system redundancy.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
TDC Acquisition Holdings, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Huntsville, Alabama
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
University of Alabama in Huntsville(UAH)	Supporting Organization	Academia	Huntsville, Alabama

Primary U.S. Work Locations

Alabama	Virginia
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Project Transitions

▶ **February 2012:** Project Start

✓ **February 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138012>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

TDC Acquisition Holdings, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

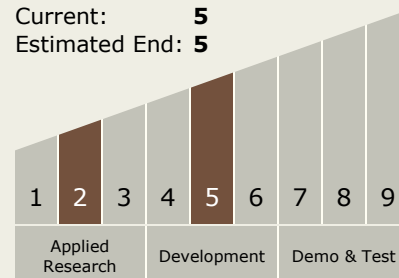
Carlos Torrez

Principal Investigator:

Brandon Dewberry

Technology Maturity (TRL)

Start: 2
Current: 5
Estimated End: 5



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - └ TX05.6 Networking and Ground Based Orbital Debris Tracking and Management
 - └ TX05.6.1 Orbital Debris Tracking

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System